
Office of the Chief Technologist
Flight Opportunities Program
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What is the Suborbital Platforms Project?

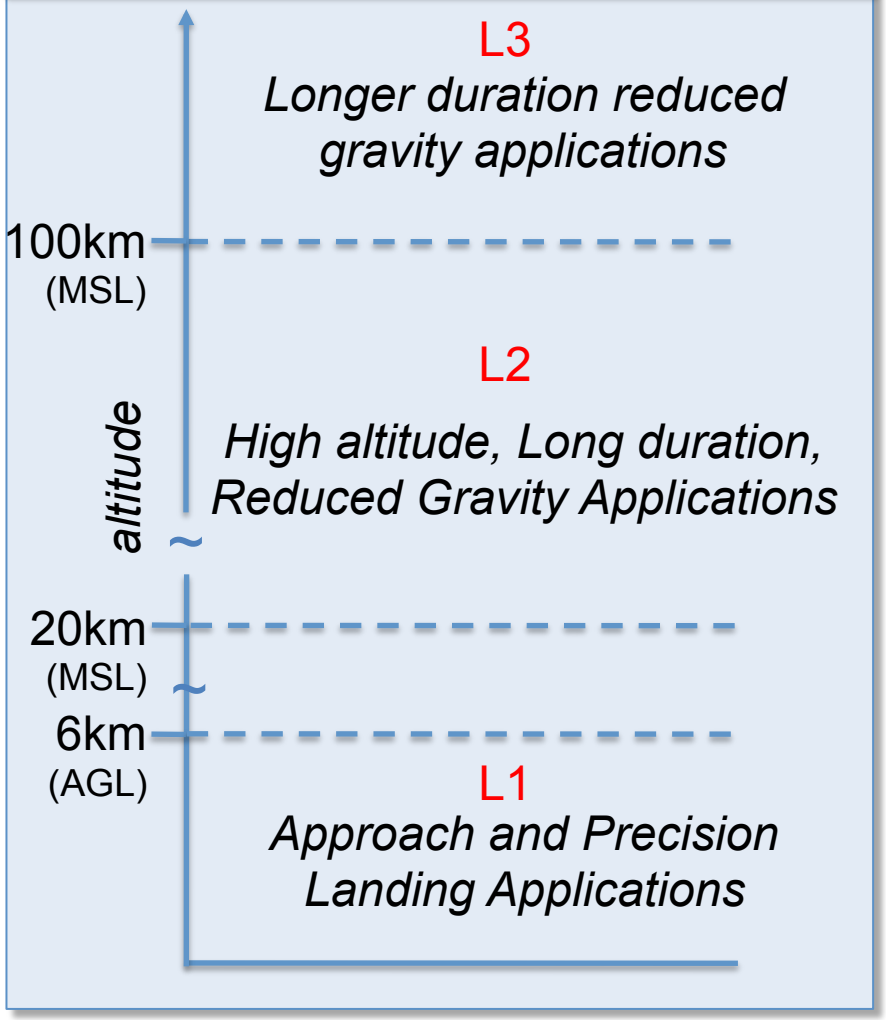
- Provides the Flight Opportunities Program with commercial service's to reach space-relevant environments and mature space technologies
- Provides a space-relevant environment through parabolic flights by JSC's Reduced Gravity Office, or suborbital Reusable Launch Vehicles (sRLV's) based off the needs of the space technology being developed

Constraints and the Acquisition Strategy for Flight & Payload Integration Services

- Primary constraints on the Program
  - Technology development at a rapid pace requires frequent flights
  - Low cost access
  - Commercial service from Multiple Vendors
  - Gov't owns no infrastructure
- Acquisition Strategy
  - Commercial services
  - Both Flight and Payload Integration services
  - Launch vehicles that fall under jurisdiction of FAA/ AST shall be licensed
  - Firm, fixed-price contracts
  - Multiple awards
  - Subsequent solicitations, as required

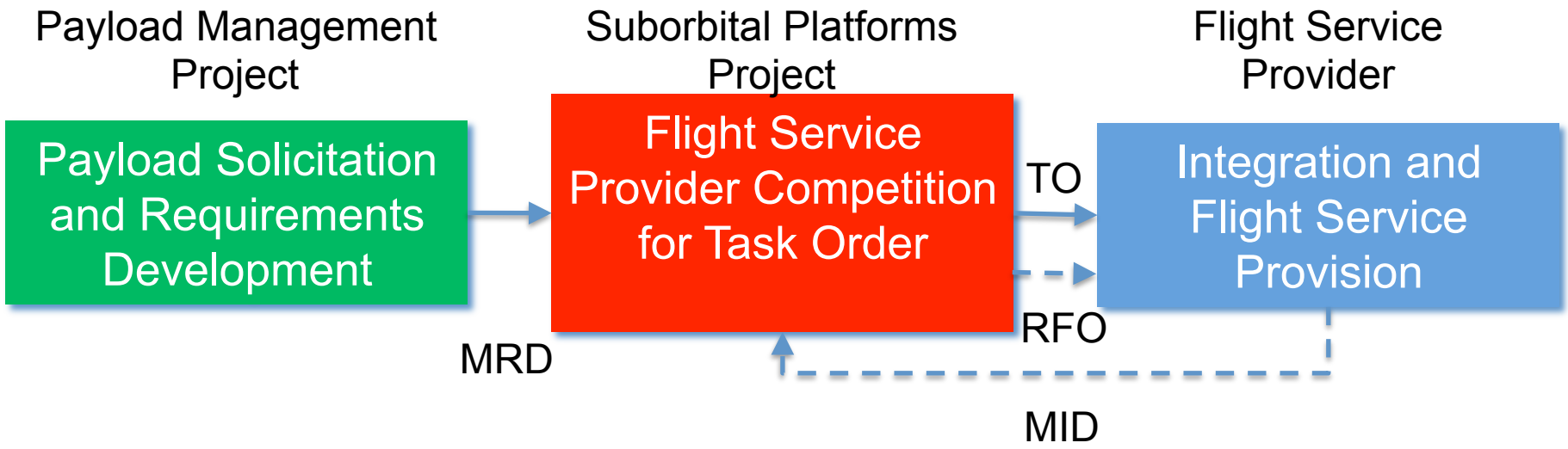
Supply Side—Commercial sRLV RFP Requirements

Basic Service Requirements



Performance Area	Requirement
Vendor to provide flight and payload integration on qualified vehicles	
Qualified Vehicle:	
Commercial, Reusable	80% reusable by mass, not incl. consumables
Frequent Flight	Payload 2x within 5 consecutive days
Min payload mass, volume	1kg, 1U CubeSat
Successful flight	Return payload undamaged
Customer access to payload prior to launch and post launch	3h prior to/post-hazardous op
System safety insight	Payload value
Number of successful flights at the required condition	1

Payload and Mission Management Lifecycle



Four Task Order Milestones for Flight Service Providers:

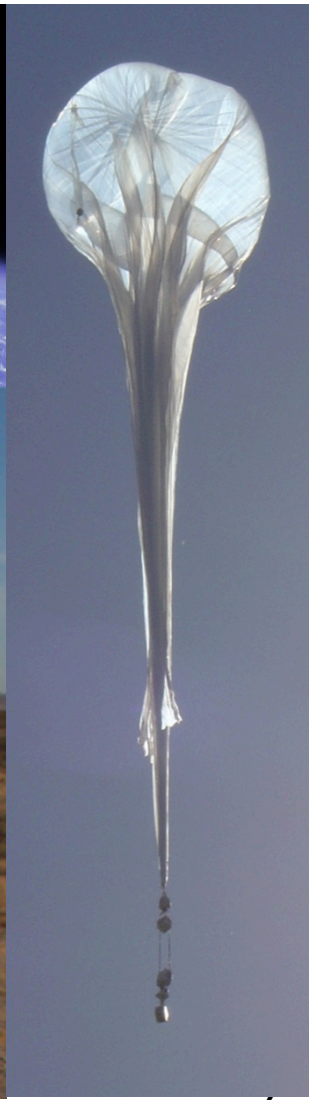
- Milestone payment 1 – Reservation of manifest
- Milestone payment 2 – Successful payload integration
- Milestone payment 3 – Successful flight
- Milestone payment 4 – Delivery of flight report

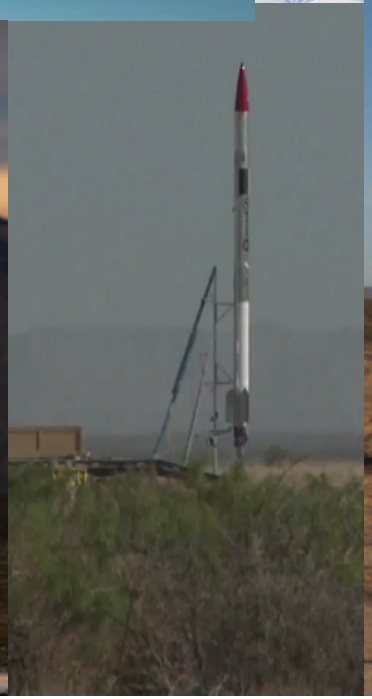
MRD: Mission Requirements Document
RFO: Request For Offer
MID: Mission Implementation Document
TO: Task Order

Contract Awards (August 2011)

- Flight Opportunities Program has selected Seven Companies to provide flight and payload integration services
  - Armadillo Aerospace, Heath, Texas
  - Near Space Corporation, Tillamook, Ore.
  - Masten Space Systems, Mojave, Calif.
  - Up Aerospace Inc., Highlands Ranch, Colo.
  - Virgin Galactic, Mojave, Calif.
  - Whittinghill Aerospace LLC, Camarillo, Calif.
  - XCOR Aerospace, Mojave, Calif.

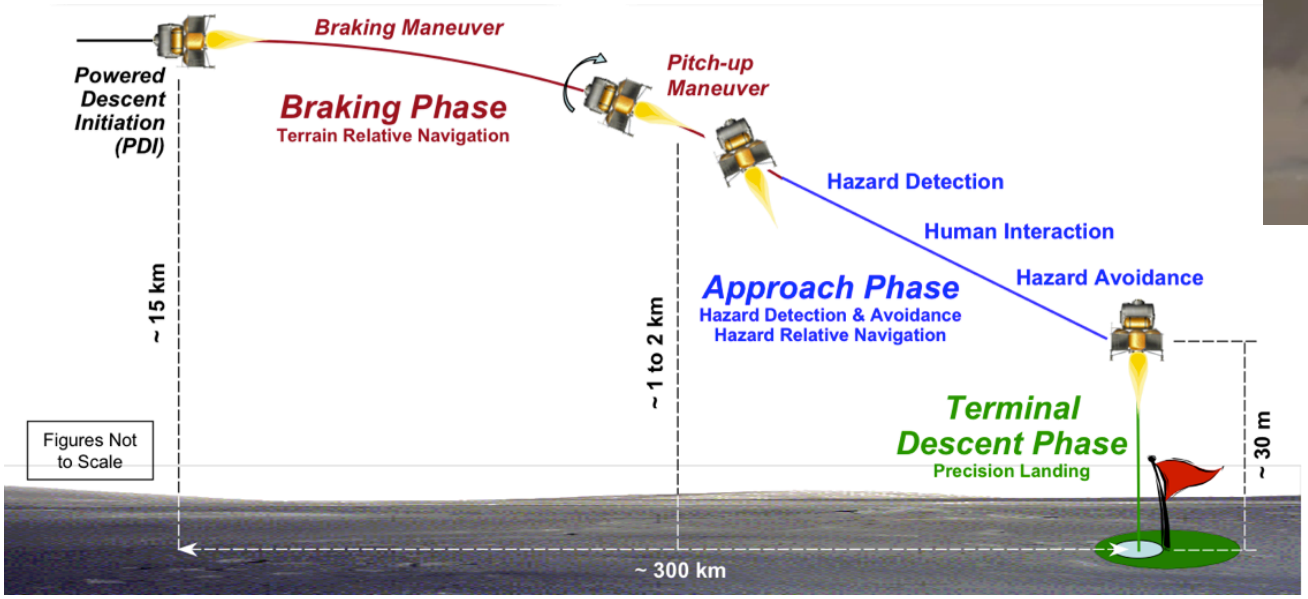
sRLV Vehicles





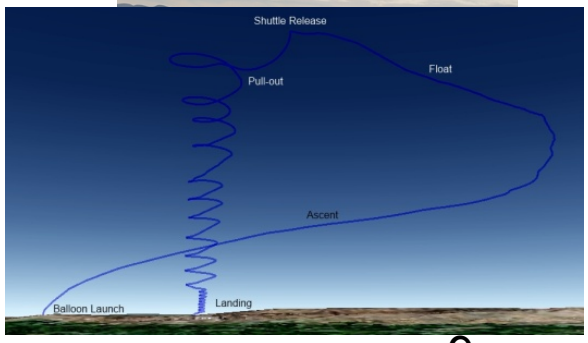
L1 - *Approach and Precision Landing Applications*

- Altitude: 0 - 6km (0 – 20kft)
- Intended Approach and Precision Landing Applications
- Current Flight Provider on Contract is Masten Space Systems



L2 - *High altitude Reduced Gravity Applications*

- Altitude: 20km – 100km (65kft – 325kft)
- Flight Providers: Armadillo Aerospace, Masten Space Systems, Near Space Corporation, Whittinghill Aerospace LLC, XCOR Aerospace
- Both sRLV's and balloons are features of this flight regime



- Near Space Corporation (NSC) features balloons that can fly payloads and float at altitudes around 100kft for long durations
- NSC also offers a UAV with capability to fly payloads back to launch site (or other programmed waypoints)

L3 - *Longer duration reduced gravity applications*

- Altitude: 100km + (365kft +)
- Flight Providers: Armadillo Aerospace, Masten Space Systems, UP Aerospace Inc., Virgin Galactic, Whittinghill Aerospace, XCOR Aerospace
- Services currently being provided by UP Aerospace with several others in the near future
- First FOP flight is Summer CY12
- L3 regime offers capabilities for a wide range of payload manifests, sizes and weights

Payload Bay
36 kg payload mass
172,070 cubic centimeters
25.4 cm max diameter
242 cm max length

Recovery Section
- Avionics
- Parachutes
- Tracking and Telemetry
- De-spin system

Booster
- Solid rocket motor
- Fin assembly

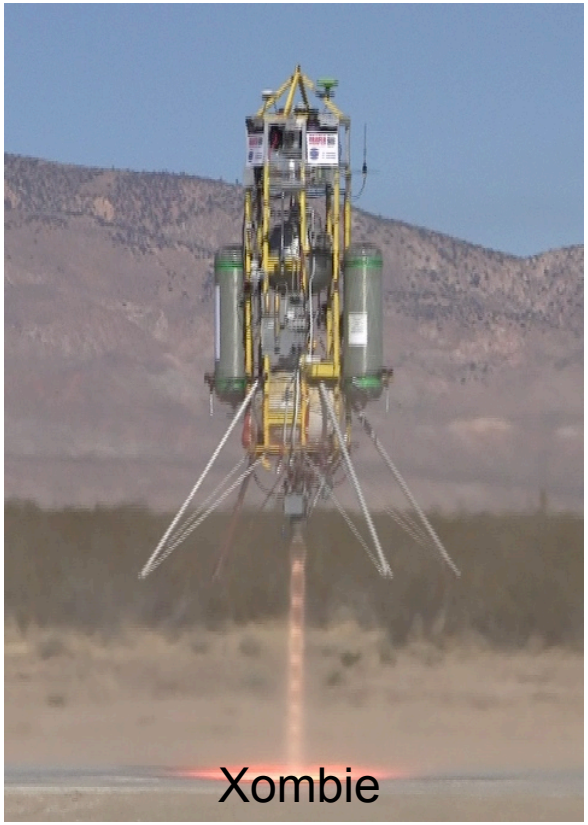
➢ ***354 kg gross liftoff weight***
➢ ***6.1 meters tall***

Parabolic Aircraft

- Flight services provided by JSC Reduced Gravity Office(RGO) through Zero-G Corp
- Flights performed at typical aircraft altitudes.
- Allows for larger payloads and provides 1 week of testing with up to 2 flights per day
- Three types of micro-gravity provided on as-required basis (Zero, Lunar, and Martian)
- 17-20 seconds reduced gravity per parabola and ~40 parabola's per day
- The RGO has well established procedures and allows researchers the freedom to gather significant data.
- Can be utilized as a stepping stone to sRLV flights

Other Flight Activities

- FOP funded development of a Commercial Vertical Testbed (CVTB)
- Masten is currently partnered with Draper Labs to perform Precision Landing Exploration Technology (PLANET) Demonstration
- Develops Guidance Embedded Navigator Integration Environment (GENIE)
- FOP Objective: expand the VTVL capability to quickly allow landing technology demonstrations



Currently Available Flight Opportunities

- 3 Parabolic Flight campaigns for CY2012: May, August, September

Vendor * / Qualified Vehicle		Location	Flight Dates **	No. of Flights	Nominal Payloads	Total Mass (kg)	Volume (m3)	Nom. Alt. (km)
Masten	Xaero	Mojave, CA	Early 2012	2	2 ***	5	0.016	5
		TBD	2012	8	2	5	0.016	30
Near Space Corp	HASS	TBD	2012/2013	1	1	10	0.041	30
	SBS	Tillamook, OR	2012	2	1	10	0.096	35
	NBS	Tillamook, OR	2012	4	1	1	0.001	30
UP Aerospace	Space-Loft XL	Spaceport America, NM	2012	1	7	36	0.172	115
Virgin Galactic	Space Ship Two	Spaceport America, NM	2013	1	30	590	1.331	100+
	TOTALS			19	60	-	-	-

* Three other suborbital flight vendors will be tasked to provide flights once they have successfully flown their qualifying vehicles.

** More definitive flight dates will be available after completion of payload selection and development.

*** ADS-B (FAA) and SFEM (ARC) payloads have been selected to fly on Masten developmental flight.

Summary

- Flight Opportunities Program has a variety of services that provide the capability for a wide range of relevant environments to mature space technologies
- NASA Space Technology Program selects technologies that align with prioritized technology areas, then the Flight Opportunities Program provides for the flight and integration services
- Flight Service Providers have a wide range of capabilities and are willing to work with technologists to meet the specific requirements of their payload

QUESTIONS?